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ABSTRACT

The purpose of this study was two-fold. One was to provide empirical evidence for the hierarchical structure of self-efficacy in terms of generality levels and the other was to investigate the relative potency of context-specific self-efficacy, i.e., academic self-efficacy in predicting academic performance. To accomplish these goals, the study focused on the structural relationships of academic self-efficacy in five school subjects, allowing the exploration of four generality levels: general, academic, domain-specific, and subject specific levels of students' self-efficacy. Korean high school students (n=430 males and 470 females) responded to general self-efficacy, academic self-efficacy, and subject-specific self-efficacy scales. Students' end-of-year achievement scores were used as a predicted variable. To examine the predictive power of academic self-efficacy expectation and the hierarchical structural relationships of differing levels of generality of self-efficacy, covariance structural modeling was used. The results of the study reveal the hierarchical structure of general, academic, and subject-specific self-efficacy, and the predictability for academic achievement. An appendix contains the general, academic, and subject-specific self-efficacy scales. (Contains 3 tables, 4 figures, and 26 references.) (Author/SLD)

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Hierarchical Structure of Self-Efficacy in Terms of Generality Levels and its Relations to Academic Performance: General, Academic, Domain-specific, and Subject-Specific Self-Efficacy.

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Abstract

The purpose of the present study is twofold: One is to provide empirical evidence for the hierarchical structure of self-efficacy in terms of generality levels and the other is to investigate the relative potency of context-specific self-efficacy, i.e., academic self-efficacy in predicting academic performance. To accomplish these goals, the present study focuses on the structural relationships of academic self-efficacy in five school subjects, which allows us to consider four generality levels, i.e., general, academic, domain-specific, and subject-specific levels of students' self-efficacy.

High school students responded to general self-efficacy, academic self-efficacy, and subject-specific self-efficacy scales. Students' end-of-year achievement scores were used as a predicted variable. To examine the predictive power of academic self-efficacy expectation and hierarchical structural relationships of differing levels of generality of self-efficacy, covariance structural modeling was used. The results of the present study revealed the hierarchical structure of general, academic, and subject-specific self-efficacy, and their predictability for academic achievement.

Introduction

Self-efficacy is defined as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (Bandura, 1986, p. 391). Initially, Bandura (1977) suggested that self-efficacy can vary along the dimensions of magnitude (level), generality, and strength. Magnitude (Bandura used the term 'level' later on) dimension is related to the task difficulty levels; generality dimension is related to the extension of efficacy expectation across the activities or situations; strength dimension is related to the variation of expectancy level among individuals. To date, however, the majority of studies pertaining self-efficacy have only focused on the strength of self-efficacy and overlooked the generality of it. In the field of education, self-efficacy is most frequently conceptualized as a task-specific or subject-specific construct, and has been examined for its relationships with various achievement indices in the context of performing a specific task, such as writing (Zimmerman & Bandura, 1994; Pajares, 1994) or subtraction (Bandura & Schunk, 1981).

Cumulated empirical evidence shows that task-specific self-efficacy has significant influence upon various types of academic performance. In fact, Pajares (1996) reviewed relevant studies and summarized that the correlations between task-specific self-efficacy and academic performance ranged from .49 to .70. Nevertheless, from the early establishment stage of self-efficacy theory, some researchers have suggested that there exist more general constructs of self-efficacy than task-specific or subject-specific ones (e.g., general self-efficacy or context-specific self-efficacy such as academic or social self-efficacy) (Kim, 1997; Kim & Cha, 1997; Owen & Froman, 1988; Pajares, 1996; Patrick, Hicks, & Ryan, 1997; Schwarzer, 1993; Sherer & Adams, 1983; Sherer, Maddux, Mercandante, Prentice-Dunn, Jacobs, & Rogers, 1982; Williams & Coombs, 1996; Zimmerman, Bandura, & Martinez-Pons, 1992; Zimmerman & Martinez-Pons,

1986). Still in another vein, researchers in academic settings continuously examined whether and how much academic self-efficacy can predict academic performance (Bandura & Schunk, 1981; Collins, 1982; Pajares & Miller, 1994; Pintrich & De Groot, 1990; Schunk, 1982; 1983; 1989). Our focus in this study lies on the construct of academic self-efficacy and its relative practicality in academic settings.

Although the terminologies used in the studies of self-efficacy are not unanimous among researchers and disciplines, we have chosen the following terms to represent differing self-efficacy generality levels in this paper. From the most general to specific generality levels, the terms we use are as follows: general, context-specific (e.g., academic, social), domain-specific (e.g., verbal, quantitative), subject-specific (e.g., English, math), and task-specific (e.g., writing, subtraction) self-efficacy. In our conceptualization of these different levels of self-efficacy construct, we have adopted and modified Bandura's (1977) original conceptualization of self-efficacy. General self-efficacy is defined as "individuals' overall judgment of their capabilities to organize and execute courses of action required to deal with goal-directed tasks in their environment." Thus, as Jerusalem and Schwarzer's conception (Jerusalem and Schwarzer, 1992; Schwarzer, 1993), it is a generalized sense of self-efficacy which refers to individual's overall confidence in their coping ability across a wide range of challenging environmental demands (Schwarzer, 1998).

Unlike previous researchers, such as Bong (1997) and Zimmerman, et al (1992) who operationally defined academic self-efficacy as the sum of individual items that measured students' perceived capability to achieve in multiple domains, such as mathematics, algebra, and the like, academic self-efficacy in the present study is defined as "individuals' overall judgment of their capabilities to organize and execute courses of action required to perform academic or school-related tasks." We have developed measures for these two constructs which will be described in the next section.

Domain-specific self-efficacy, that is verbal and quantitative in this study, is

defined as "summated efficacy ratings in language-related subjects, and mathematics-related subjects, respectively." And the subject-specific self-efficacy is operationalized as, in the antecedent studies (Zimmerman, Bandura, & Martinez-Pons, 1992), summated efficacy ratings for a particular subject.

In line with the general self-efficacy research trend, Park (1999) probed the relationship between general, academic, and subject-specific self-efficacy. As a result, it was proven that academic self-efficacy had influence on two types of domain-specific self-efficacy, i.e., verbal and quantitative, each consisting of scores of relevant subject-specific self-efficacy. In addition, she examined the correlation between general and academic self-efficacy, and compared their predictability for academic achievement. The results indicate that students who, in general, judge themselves efficacious also have a strong sense of academic self-efficacy (r=.74, p<.001), and that academic self-efficacy (R^2=.12, $F_{1,290}$=38.61, p<.001) is more useful than general self-efficacy (R^2=.03, $F_{1,290}$=7.43, p<.01) in predicting academic performance.

In Park's study, however, the relationship among generality levels of self-efficacy as a whole was not investigated to contend a hierarchical nature of different levels of self-efficacy beliefs. Therefore, in the present study, we attempt to investigate the hierarchical relationship among generality levels of self-efficacy, i.e., whether general self-efficacy predicts academic self-efficacy, and academic self-efficacy predicts domain-specific or subject-specific self-efficacy, which in turn predicts domain-specific or subject-specific performance.

It may be obvious that the more specific the generality level of self-efficacy, the stronger its predictability for the corresponding performance. In fact, substantial amount of empirical evidence has shown the powerful predictability of task-specific self-efficacy for the performance of relevant tasks as reviewed above. However, if the predictability of academic self-efficacy for academic achievement is more or less similar to that of domain-specific or subject-specific self-efficacy, it may be of more value to educators. In some school settings, rather lower but significant predictability of academic self-efficacy may be of more

value to educators. Information on individual students' task-specific or subject-specific efficacy strength can only help educators to understand students and provide guidance in a limited scope, but information on students' more general academic self-efficacy will broaden the scope of applicability in their understanding of students and provide direction for guidance.

In addition, if the hierarchical structure of self-efficacy is identified, it will provide researchers with a benchmark to select an appropriate self-efficacy construct and to synthesize the results of their studies. Moreover, by using the context-specific self-efficacy construct rather than more specific ones, researchers will be able to predict the performance of various tasks more effectively.

Therefore, the present investigation attempts to test following hypotheses: (1) Subject-specific self-efficacy will be the best predictor of the relevant achievement which is the most prevalent contention. (2) Domain-specific self-efficacy (academic self-efficacy) will be as useful as subject-specific self-efficacy. (3) The structural relationships among general, academic, and domain-specific self-efficacy will be hierarchical in nature.

Methods

Data Source

Data for this investigation were collected from approximately 900 high school freshmen (about 430 males from nine boys' classes and 470 females from ten girls' classes) attending typical girls' and boys' high schools in a middle class residential area of metropolitan Seoul, Korea. As a result of data cleaning which includes inspection of insincere or careless responses, such as same numbers throughout the whole pages or too many missing responses, 761 cases (361 males: 47%; 400 females: 53%) remained in the final analyses. A typical Korean high school class consists of approximately fifty students.

Instruments

Instruments used in this study were the Korean General Self-Efficacy Scale (Kim, 1997, hereafter GSE), Academic Self-Efficacy Scale (Kim & Park, 1999, hereafter ASE), and a subject-specific self-efficacy questionnaire (hereafter SSSE). A detailed explanation of the construction and validation procedures for the GSE and ASE are presented elsewhere (Kim & Cha, 1997; Kim & Park, 1999), so we will only briefly describe the three scales in this report.

The GSE consists of twenty-four 6-point Likert-type items with three subscales, each of which measures self-confidence (7 items), self-regulatory efficacy (12 items), and task difficulty preference (5 items). It was originally developed by Kim & Cha (1997), in Korean language, on the basis of Bandura's conceptualization of his early theory of self-efficacy (Bandura, 1977) and the underlying processes of self-efficacy functioning described by him (Bandura, 1993). The scale has been validated in previous studies (Kim, 1997; Kim & Lim, 1999). Cronbach's alpha for the subscales were consistently around or above .80 for all three subscales. Factor analyses results revealed three factors consistently in the previous studies for the past three years (Kim, 1997, Kim & Lim, 1999, Kim & Park, 1999).

The ASE which has been developed, in Korean language, and validated by Kim and Park (1999), consists of twenty-five 6-point Likert-type items with the same subscales and with the parallel item content as those of GSE: Correlations between corresponding subscales in GSE and ASE were .62, .74, and .68 for self-confidence, self-regulatory, and task difficulty preference, respectively; Alpha's for the 8-item self-confidence subscale, 9-item self-regulatory efficacy subscale, and 8-item task difficulty preference subscale were .74, .78, and .84, respectively in Kim and Parks' (1999) study. Test-retest reliabilities of the subscales of ASE obtained from data from 119 freshmen in a different high school were .70, .63, and .51, respectively. The SSSE for each school subject consists of two 6-point Likert-type items which require students to report their self-confidence for five major subjects, i.e., Korean, English, social studies, mathematics, and science. To eliminate order effect of items and scales, the SSSE items were randomly scrambled with GSE items and bound into one test booklet. ASE items were

separately assembled.

Items from the three scales were translated into English by a Korean-English bilingual college graduate. GSE, ASE, and SSSE items are presented in the appendix, along with some psychometric property indices.

Procedures

Instruments were administered to intact classes by school counselors who, prior to administration, were given information about the purpose of this study. ASE was first administered in July and then GSE and SSSE were administered in December of 1999. In Korea, the first semester begins in March and ends in July, and the second semester begins in August and ends in February. Students' end-of-year exam scores were collected and transformed into T-scores to be used as a criterion of academic achievement.

Analysis

To probe the hierarchical relationships among general, academic, domain-specific, and subject-specific self-efficacy, and to compare their predictability for academic achievement, analysis of covariance structure were conducted on the basis of correlation matrices of the three GSE subscale scores, three ASE subscale scores, five SSSE scores, and end-of-year exam scores of five major school subjects. SAS 6.12 and LISREL 8.12 programs were used for statistical analysis.

Results

Preliminary Analyses

Preliminary analyses of the male and female participants' responses to all scales showed that there are no particular gender differences among the means and the standard deviations. Also an inspection of the zero-order correlation matrices of the two groups indicated similarity between the two. Therefore, data

were not separated by gender in testing the structural models.

Table 1 shows two panels of data. The upper panel show the matrix of correlations among the sixteen scales that are the components of GSE (three), ASE (three), SSSE (five), and standardized scores of five school subjects. The sizes of correlation coefficients in this table show that those scale scores are moderately correlated each other with few exception and the sizes of their correlations vary substantially. This correlation matrix of Table 1 used as input data for testing structural relationship among the latent traits under investigation in this study.

<Insert Table 1 here>

The lower panel of Table 1 shows the means and the standard deviations of the sixteen scales, which are subscales of general, academic, and subject-specific self-efficacy ratings [self-efficacy for Korean (SE-KOR), social studies (SE-SOC), English (SE-ENG), math (SE-MAT), and science (SE-SCI)] and achievement scores of five school subjects [achievement of Korean (ACH-KOR), social stuies (ACH-SOC), English (ACH-ENG), math (ACH-MAT), and science (ACH-SCI)]. In this panel, description of the last five school subject scores shows that they were standardized as mean of 50 and SD of 10, which are known as T-scores. The lower panel also shows the measure of internal consistencies (α) and number of items in each of the scales. The estimated reliabili쇼 coefficients are all moderate ranging from .69 to .88.

Table 2 shows another correlation matrix. The elements of the matrix are the bivariate correlations among ten measured variables consisting the SSSE scales and five subject scores appeared in Table 1. This correlation matrix is also used as input data for testing structural relationships among SSSE's and five achievement scores that is called as Model 1 in this paper. Again the correlation coefficients vary substantially.

<Insert Table 2 here>

Test of Structural Modelings

We developed five models to test our hypotheses. Description of each model is presented in the first column of Table 3. Model 1 is to test the most widely accepted and empirically evidenced contention that subject-specific (or task-specific) self-efficacy (SSSE) is the best predictor of corresponding performance (Hypothesis 1). Model 2 is to test whether academic self-efficacy (ASE) is as useful as SSSE (Hypothesis 2). Model 3 and 4 are to test hierarchical relationships among general, academic, and domain-specific self-efficacy (Hypothesis 3).

<Insert Table 3 here>

To judge the fit of each model, omnibus fit statistics are presented in Table 3. A close look at the size of fit statistics in Table 3 gives an insight of the relative goodness of the hypothesized models. Overall, the fit indices of these models show reasonable consistency and acceptable values. Those fit indices of relative goodness statistics (e.g., NFI , NNFI, and CFI) are extremely high ranging from .97 to .99. Also the absolute indices of goodness-of-fit statistics are excellent in terms of RMSEA, GFI, and AGFI in Model 2, but moderate in the other four models. Collectively speaking, the five models can account for the most variance in the data and are not based on biased sample data. In other words, the parameter estimates from these models would be admissible.

Predictive Power of Subject-Specific Self-Efficacy for Subject-Specific Achievement

Model 1 which depicts the relationship among five SSSE and achievement of five school subjects is presented in Figure 1. Although soundness of this model is not as good as other models (RMSEA = .10; RMR = .23; GFI = .89; AGFI = .81), it is safe to say that this model supports Hypothesis 1 and confirms the

most popular belief that in order to predict particular task performance, individual's efficacy expectation of that particular task should be estimated.

<Insert Figure 1 here>

Parameter estimates of Model 1 show that all path coefficients (standardized estimates are reported in this study) from the five SSSE's to academic achievement of five subjects are positively significant as the theory expected except the coefficients from SE-KOR (perceived efficacy of Korean). SE-KOR predicts ACH-KOR (achievement in Korean) in positive direction but its effects on the other subjects (i.e., social studies, English, math, science) are negative. It is not clear at this point why SE-KOR's effects on the other subjects are negative.

Except the SE-KOR, each of the four SSSE's not only predicts the achievement of directly related subjects but also supports the achievement of unrelated subjects. These findings of the coefficients from the SSSE's to academic achievement may imply the existence of the commonality among the SSSE's which can infer the self efficacy at general level. The effects of self-efficacy at higher level on the achievement will be tested in the second model after this section.

Predictive Power of Academic Self-efficacy for Subject-specific Achievement

In Model 2, depicted in Figure 2, we added the ASE variable to Model 1 to see the relationship between ASE and SSSE, and corresponding performance. Parameter estimates for the direct and indirect effects of ASE on the achievement of five respective subjects are all significant at $p < .01$, indicating the predictive power of ASE.

Two important patterns of findings are evident. One pattern is that the sizes of the path coefficients from ASE to SSSE's are consistently bigger than those between ASE and subject-specific achievement measures, except for ASE and

ACH-KOR. Another pattern of findings is, which is surprising, that those direct effects from ASE to the five academic achievement scores are consistently stronger that the effects from SSSE's to corresponding achievement scores of five subjects. Taken together, these two patterns of findings prove the Hypothesis 2. In other words, ASE has relatively stronger power than the SSSE's in predicting the achievement of five subjects, which is often ignored in previous studies of self-efficacy.

<Insert Figure 2 here>

In Model 3, presented in Figure 3, depicts the relationships among context-specific efficacy (ASE), domain-specific efficacy (self-efficacy for verbal and quantitative domain), and domain-specific achievement (achievement in verbal and quantitative domain). Self-efficacy for verbal domain (VSE) was determined by combining three SSSE values, i.e., SE-KOR, SE-SOC, and SE-ENG. Self-efficacy for quantitative domain (QSE) was determined by combining two SSSE values, i.e., SE-MAT and SE-SCI. The same procedure was used to determine the combined achievement for verbal (VACH) and for quantitative (QACH).

Parameter estimates for the two sets of direct path coefficients from ASE to VSE, VACH, QSE, and QACH are all significant at $p < .05$. These findings also prove the predictive power of ASE on both domain-specific self-efficacy and achievement, which confirms the Hypothesis 2.

<Insert Figure 3 here>

Hierachical Nature of Differing Self-efficacy Generality Levels

Investigation of Model 3 also provides evidence of hierarchical nature of self-efficacy in terms of generality levels. ASE is a very powerful predictor for VSE ($\gamma = .76$) and QSE ($\gamma = .79$). VSE and QSE are significant predictor for

VACH (β = .38) and VQNT (β = .42). Though the direct effect of ASE on each achievement measures are significant, the size of the effect is smaller than in the two hierarchically linked relations (γ = .25 for both VACH & VQNT).

We then specify Model 4 within which Model 3 is nested. Model 4 posits GSE, ASE, VSE, QSE, VACH, and QACH in a hierarchical mode, that is, it specifies a direct effect of GSE on ASE, a direct effect of ASE on VSE and QSE, and a direct effect of VSE on VACH and QSE on QACH. Figure 4 shows the hierearchical relationship among the construct variables in the model. The effect of GSE on ASE (γ = .89) is stronger than any other effect in the model. This is a due result considering that the underlying constructs of GSE and ASE are the same in both scales. Here again ASE is a powerful predictor of VSE (β = .78) and QSE (β = .83).

<Insert Figure 4 here>

The relationship between VSE and VACH is near zero (ψ = .08 in Model 3, .01 in Model 4) but that between VACH and QACH is significant (ψ = .56 in Model 3, .58 in model 4) is worth noting.

These results are worth noting because even though we measure the ASE with only three general indicators of academic self-efficacy unlike the previous researchers (Bong, 1997; Zimmerman, et. al, 1992) who used sums of individual task-specific efficacy item-ratings as an index of academic self-efficacy, ASE still keeps its predictive power on VSE and QSE. Thus, the self-efficacy measured at higher level in terms of generality does not lower its power in predicting domain-specific achievement. Testings of the Model 4 along with Model 3 confirm the hierarchical relationships among efficacy beliefs of different levels in generality dimension of perceived self-efficacy.

Conclusion

In the present study three hypotheses that we examined were all supported. Hypothesis 1, the contention that subject-specific self-efficacy belief predicts subject-specific achievement the best, has been confirmed. However, results also indicate that self-efficacy expectation in one subject area predicts achievement in other academic achievement as well. Unlike currently prevailing belief that the more general the self-efficacy judgment obtained the more inaccurate the prediction for performance and that the predictive power of this specificity-lacking assessment minimizes the influence of self-efficacy (e.g., Bandura, 1986; Pajares, 1996), findings of the present investigation disprove this belief. Rather, the speculation that context-specific self-efficacy is a significant predictor of specific performance is proven to be valid.

Hypothesis 2 which states that academic self-efficacy is as useful as subject-specific self-efficacy has been confirmed. This finding is particularly exciting because we assessed academic self-efficacy with an omnibus-type instrument which we developed. Even though majority of leading scholars in the study of self-efficacy have strongly suggested not to use a general omnibus-type instrument, in reality, task-specific self-efficacy informations doesn't do much in general academic guidance for students with academic problem in general. Implication from this prevailing contention to educators are clear but limited to specific task-related problems, whereas implication from the present findings can be applied to academic problems in most school subjects.

One interesting finding is that verbal and quantitative self-efficacy is not correlated. This result is in line with previous findings in academic self-concept studies but not with Bong's result as discussed in Bong (1997), which posits more power on the practicality of omnibus type measure of academic self-efficacy with proper sub-constructs. In fact, the predictive power of ASE has been shown repeatedly in our previous studies in Korea (Kim & Park, 1999; Cho, 1999).

Hypothesis 3 which test the existence of hierarchically structured relationships among differing generality levels of self-efficacy beliefs has been confirmed.

The hierarchical relationships were evident in Model 3 where ASE (context-specific self-efficacy) was posited to predict VSE and QSE (domain-specific self-efficacy) which, in turn, predicted VACH and QACH, respectively. In Model 4 we posited GSE (general self-efficacy), ASE, VSE and QSE, and VACH and QACH. Here again, the relations among these variables were significant and show pattern of hierarchy.

Moreover, the findings of the present study support validity of the ASE scale. Construct, concurrent, and predictive validity are all evident in the results. More elaboration and validation study will ensure a powerful and practical measure for academic self-efficacy.

In sum, results from the present study revealed the hierarchical structure of general, academic, and subject-specific self-efficacy, and their predictability for academic achievement. However, interpretation and generalization of the present findings should be limited to High school students with similar background. Especially the cultural difference may be an important factor.

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<Table 1> Means, Standard Deviations, and Cronbach's α of 16 Variables and Correlation Matrix Used in Model 2 - 4 (N=761)

	GSR	GSC	GTD	ASR	ASC	ATD	SE-KOR	SE-SOC	SE-ENG	SE-MAT	SE-SCI	ACH-KOR	ACH-SOC	ACH-ENG	ACH-MAT	ACH-SCI
GSR	1.000															
GSC	0.379	1.000														
GTD	0.468	0.270	1.000													
ASR	0.639	0.215	0.383	1.000												
ASC	0.327	0.490	0.248	0.347	1.000											
ATD	0.342	0.153	0.581	0.491	0.224	1.000										
SE-KOR	0.423	0.218	0.123	0.290	0.162	0.020	1.000									
SE-SOC	0.447	0.215	0.251	0.501	0.255	0.250	0.378	1.000								
SE-ENG	0.364	0.134	0.212	0.397	0.218	0.214	0.242	0.325	1.000							
SE-MAT	0.427	0.123	0.357	0.413	0.166	0.532	-0.003	0.229	0.253	1.000						
SE-SCI	0.472	0.200	0.363	0.473	0.204	0.440	0.124	0.414	0.238	0.564	1.000					
ACH-KOR	0.268	0.042	0.135	0.350	0.128	0.229	0.146	0.324	0.285	0.278	0.337	1.000				
ACH-SOC	0.260	0.078	0.128	0.375	0.137	0.254	-0.005	0.417	0.271	0.307	0.369	0.669	1.000			
ACH-ENG	0.231	0.010	0.143	0.365	0.137	0.284	-0.015	0.246	0.510	0.355	0.295	0.684	0.717	1.000		
ACH-MAT	0.242	0.001	0.220	0.342	0.138	0.389	-0.099	0.222	0.282	0.562	0.416	0.576	0.621	0.686	1.000	
ACH-SCI	0.277	0.021	0.188	0.408	0.117	0.330	-0.007	0.346	0.244	0.381	0.498	0.691	0.701	0.682	0.726	1.000
Mean	3.963	3.620	3.493	3.703	3.937	3.152	3.933	3.999	3.434	3.430	3.194	50.00	50.00	50.00	50.00	50.00
SD	0.625	0.900	0.869	0.713	0.856	0.929	1.012	1.013	1.123	1.213	1.151	9.993	9.993	9.993	9.993	9.993
α	0.86	0.82	0.83	0.85	0.83	0.88	0.75	0.69	0.78	0.81	0.78					
Items	12	7	5	9	8	8	2	2	2	2	2					

NOTE. GSR, GSC, GTD represent Self-Regulatory Efficacy, Self-Confidence, Task Difficulty Preference in General Self-Efficacy Scale, respectively. ASR, ASC, ATD represent Self-Regulatory Efficacy, Self-Confidence, Task Difficulty Preference in Academic Self-Efficacy Scale, respectively. SE-KOR, SE-SOC, SE-ENG, SE-MAT, SE-SCI represent Subject-Specific Self-Efficacy for Korean, Social Studies, English, Mathematics, Science, respectively. ACH-KOR, ACH-SOC, ACH-ENG, ACH-MAT, ACH-SCI represent Standardized Achievement Score for Korean, Social Studies, English, Mathematics, Science, respectively.

<Table 2> Correlation Matrix of 15 Measured Variables Used in Model 1 (N=743)

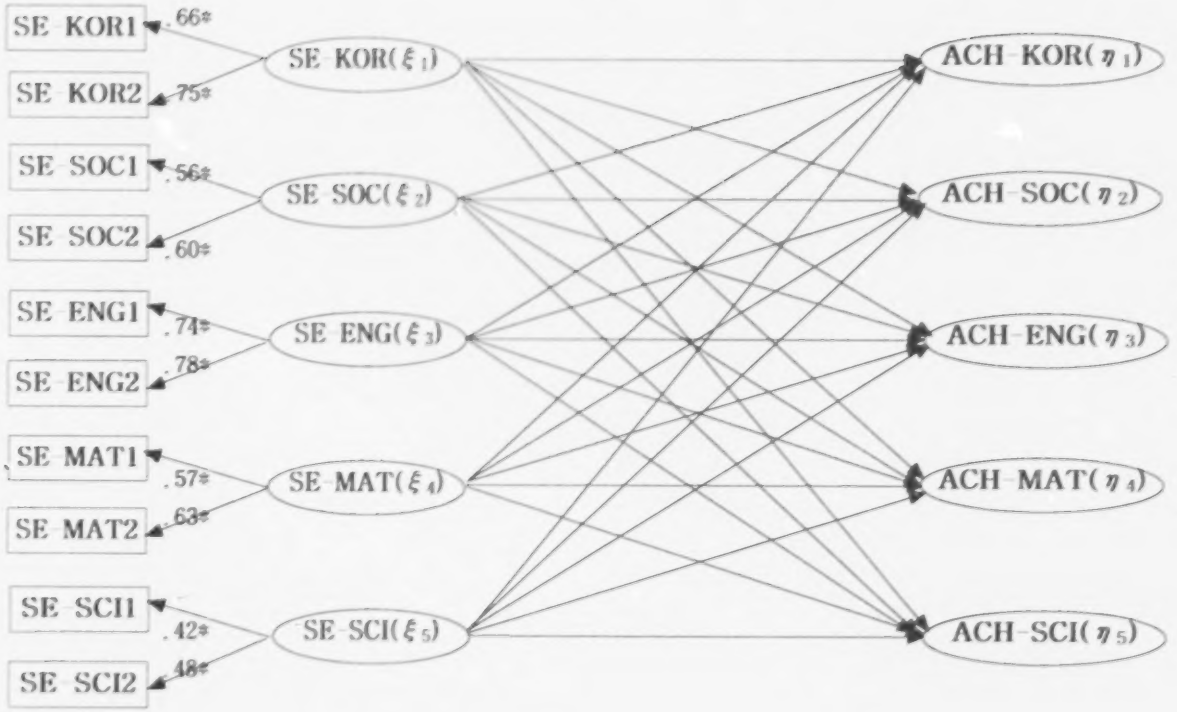
	SE-KOR1	SE-KOR2	SE-SOC1	SE-SOC2	SE-ENG1	SE-ENG2	SE-MAT1	SE-MAT2	SE-SCI1	SE-SCI2	ACH-KOR	ACH-SOC	ACH-ENG	ACH-MAT	ACH-SCI
SE-KOR1	1.000														
SE-KOR2	0.745	1.000													
SE-SOC1	0.321	0.245	1.000												
SE-SOC2	0.346	0.386	0.693	1.000											
SE-ENG1	0.228	0.186	0.262	0.261	1.000										
SE-ENG2	0.233	0.208	0.280	0.321	0.779	1.000									
SE-MAT1	0.039	-0.031	0.230	0.133	0.209	0.211	1.000								
SE-MAT2	0.002	-0.042	0.235	0.188	0.211	0.252	0.810	1.000							
SE-SCI1	0.128	0.077	0.451	0.308	0.197	0.212	0.463	0.494	1.000						
SE-SCI2	0.130	0.109	0.345	0.339	0.204	0.237	0.494	0.569	0.776	1.000					
ACH-KOR	0.176	0.112	0.333	0.271	0.286	0.263	0.262	0.289	0.307	0.343	1.000				
ACH-SOC	0.029	-0.038	0.379	0.393	0.251	0.267	0.276	0.330	0.332	0.381	0.670	1.000			
ACH-ENG	0.031	-0.049	0.252	0.202	0.476	0.497	0.330	0.368	0.273	0.290	0.689	0.716	1.000		
ACH-MAT	-0.059	-0.130	0.221	0.179	0.277	0.262	0.506	0.574	0.376	0.410	0.579	0.622	0.686	1.000	
ACH-SCI	0.017	-0.021	0.341	0.304	0.236	0.238	0.341	0.404	0.456	0.494	0.692	0.702	0.684	0.729	1.000

NOTE. SE-KOR, SE-SOC, SE-ENG, SE-MAT, SE-SCI represent Subject-Specific Self-Efficacy for Korean, Social Studies, English, Mathematics, Science, respectively. ACH-KOR, ACH-SOC, ACH-ENG, ACH-MAT, ACH-SCI represent Standardized Achievement Score for Korean, Social Studies, English, Mathematics, Science, respectively.

<Table 3> Model Descriptions and Goodness-of-Fit Indices

Model	Description	χ^2	df	RMSEA	RMR	GFI	AGFI	NFI	NNFI	CFI
1	Five subject-specific self-efficacy and five subject-specific achievement	614.79	70	0.10	0.23	0.89	0.81	0.99	0.98	0.99
2	Academic self-efficacy, five subject-specific self-efficacy, and five subject-specific achievement	211.31	46	0.069	0.075	0.96	0.92	0.99	0.99	0.99
3	Academic self-efficacy, two domain-specific self-efficacy, and two domain-specific achievement	466.95	57	0.097	0.11	0.91	0.85	0.98	0.97	0.98
4	General self-efficacy, Academic self-efficacy, and two domain-specific self-efficacy and two domain-specific achievement	784.23	95	0.098	0.12	0.87	0.82	0.97	0.97	0.97

Note. RMSEA = Root mean square error of approximation; RMR = Root mean square residual; GFI = Goodness-of-fit index; AGFI = Adjusted goodness-of-fit index; NFI = Normed fit index; NNFI = Non-normed fit index; CFI = Comparative fit index. All fit indices from LISREL analyses(Joreskog & Sorbom, 1993).



γ (GAMMA)

	ξ1	ξ2	ξ3	ξ4	ξ5
η1	.13*	.43*	.30*	.34*	.59*
η2	-.12	.58*	.27*	.33*	.54*
η3	-.06	.34*	.62*	.42*	.50*
η4	-.15	.27*	.27*	.64*	.50*
η5	-.08	.40*	.22*	.38*	.71*

FIGURE 1. MODEL 1: Relations among five subject-specific self-efficacy factors (SE-KOR, SE-SOC, SE-ENG, SE-MAT, SE-SCI) and achievement scores of five subjects (Korean, Social Studies, English, Math, Science). Standardized parameter estimates are shown. Estimates significant at $p < .05$ are marked with *.

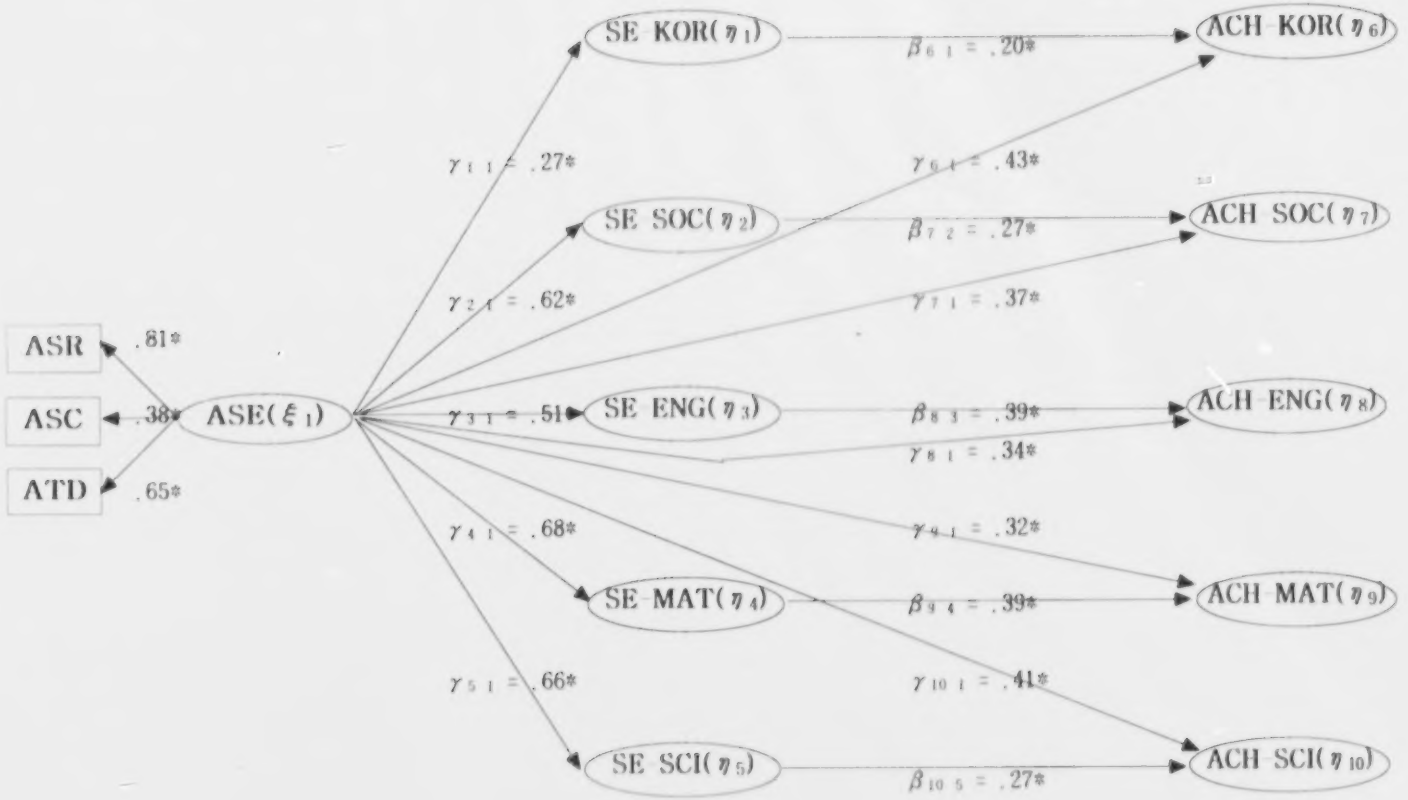


FIGURE 2. MODEL 2: Relations among academic self-efficacy (ASE), five subject-specific self-efficacy (SS-KOR, SS-SOC, SE-ENG, SS-MAT, SS-SCI) and achievement in five subjects (ACH-KOR, ACH-SOC, ACH-ENG, ACH-MAT, ACH-SCI). ASR, ASC, and ATD represent subscales of ASE. Standardized parameter estimates are shown. Estimates significant at $p < .05$ are marked with *.

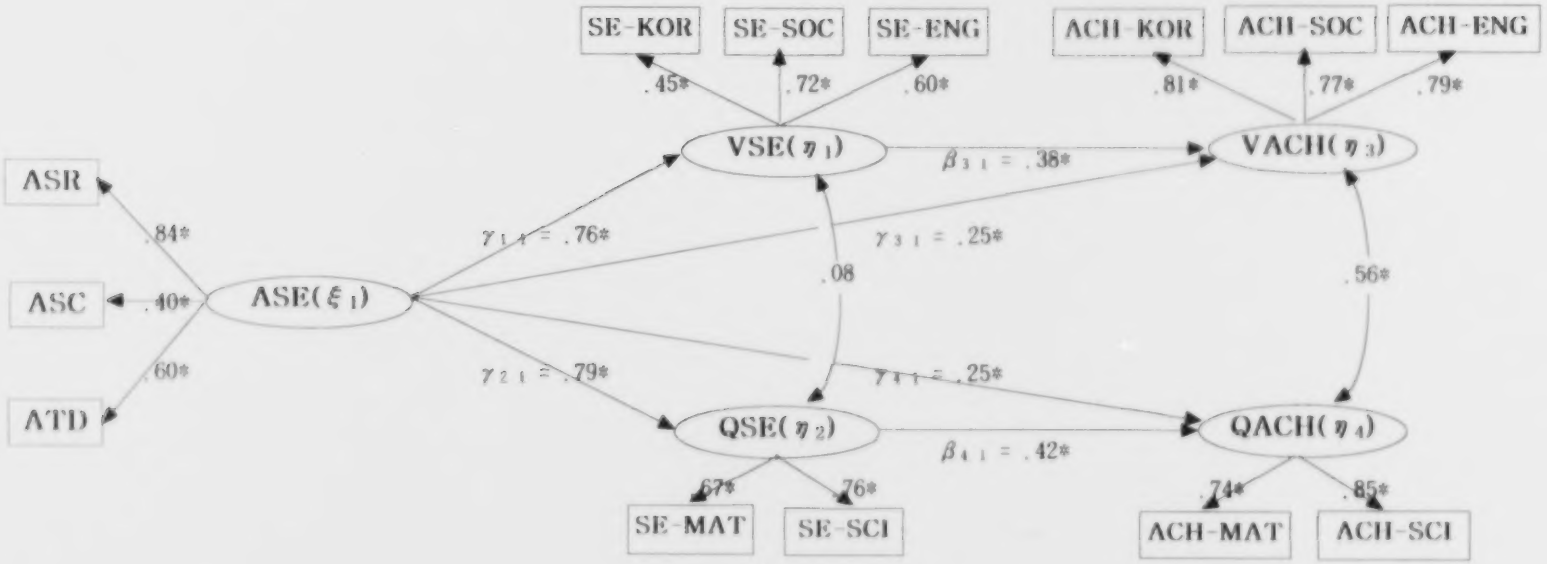


FIGURE 3. MODEL 3: Relations among Academic self-efficacy, verbal self-efficacy (VSE), quantitative self-efficacy (QSE), verbal achievement (VACH), and quantitative achievement (QACH). Standardized parameter estimates are shown. Estimates significant at $p < .05$ are marked with *.

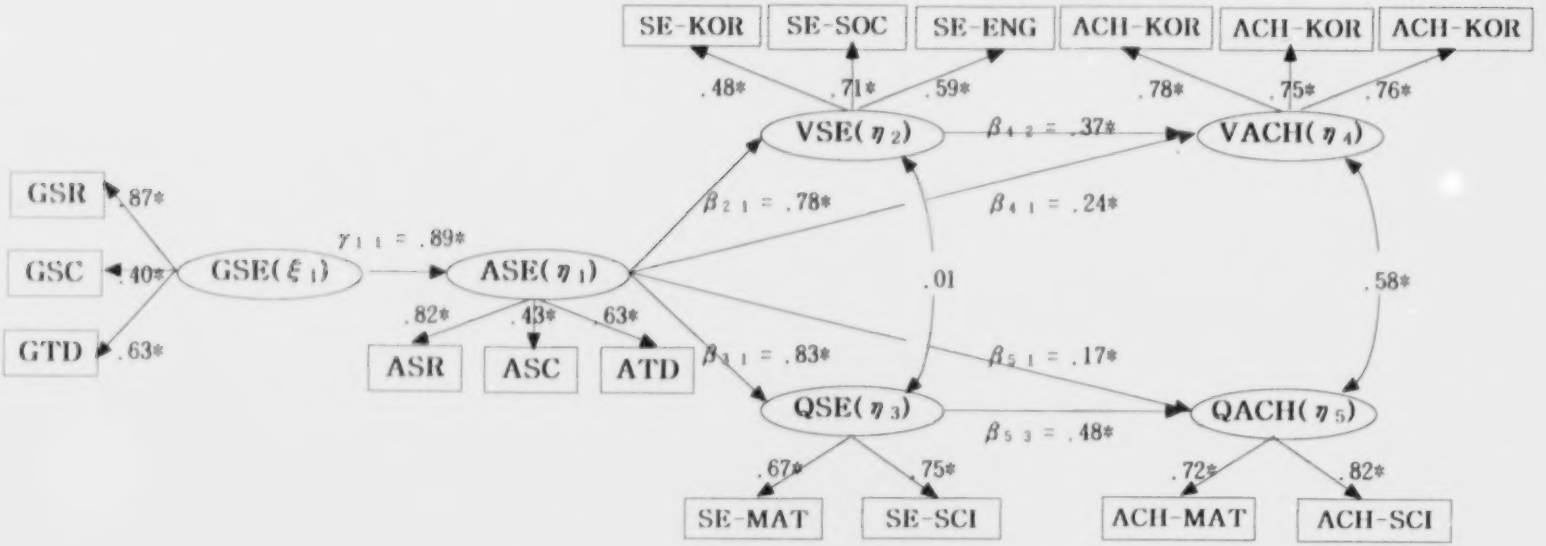


FIGURE 4. MODEL 4: Relations among general self-efficacy (GSE), academic self-efficacy (ASE), verbal self-efficacy (VSE), quantitative self-efficacy (QSE), verbal achievement (VACH), and quantitative achievement(QACH). Standardized parameter estimates are shown. Estimates significant at $p < .05$ are marked with *.

APPENDIX A. General Self-Efficacy Scale

	factor 1 (GSR)	factor 2 (GSC)	factor 3 (GTD)
* Self-regulatory efficacy items			
1. Whatever the task may be, I can complete it with accuracy.	0.73562	0.20031	0.25142
2. I can handle tasks in a well-structured manner.	0.68585	0.16715	0.28388
3. I am able to do good at analyzing cause and effect.	0.64969	0.16085	0.27976
4. I think I am skilled in accurate assessment.	0.59245	0.24035	0.13796
5. I am able to do good at planning.	0.57136	0.09492	0.18427
6. When I feel that something is not going well I can quickly steer it back in the right direction.	0.58351	0.24659	0.17142
7. I can set goals and then assess my state of progress in light of those goals.	0.57637	0.12793	0.23694
8. I am well able to utilize any information required to complete a given task.	0.57719	0.20049	0.28718
9. I am capable of overcoming difficult situations.	0.61441	0.38979	0.37931
10. I can continue to work even when I am having trouble.	0.49355	0.26901	0.40290
11. I am able to discriminate between what I can or cannot do.	0.35320	0.22023	0.06152
12. Even when I am unsuccessful at first, I hang in there until I am successful.	0.38476	0.21952	0.42367
* Self-confidence items			
1. I feel nervous that I won't be able to handle dangerous situations.(R)	0.25020	0.75023	0.15796
2. When there is a difficult situation I have no idea what to do.(R)	0.25222	0.75138	0.23214
3. When I am having a major problem I get so nervous that I can't do anything.(R)	0.19294	0.71591	0.18115
4. I get very stressed by threatening situations.(R)	0.09872	0.59301	0.11103
5. I feel depressed in uncomfortable situations.(R)	0.05096	0.56579	0.07483
6. When I am beginning a task I sometimes feel that I am going to fail.(R)	0.27703	0.57872	0.13180
7. The people around me seem to be in general more talented than myself.(R)	0.33432	0.44672	0.14245
* Task-difficulty preference items			
1. I prefer a difficult task to one that is way too easy.	0.29253	0.13205	0.81117
2. I enjoy difficult tasks, even if I may make a few mistakes.	0.32667	0.20172	0.78792
3. If I had the choice, I would pick an easy task over a hard one.(R)	0.12005	0.14665	0.71334
4. It's fun to struggle through a difficulty or a challenge.	0.38018	0.23053	0.65074
5. The easier the task, the better I like it.(R)	0.19671	0.14776	0.59340

Note. Factor structure coefficient matrix is presented. (R) represents reverse coding item.

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APPENDIX B. Academic Self-Efficacy Scale

	factor 1 (ATD)	factor 2 (ASC)	factor 3 (ASR)
* Task-difficulty preference items			
1. I prefer solving one hard problem to solving many easy ones.	0.75643	0.09096	0.27180
2. I like hard subjects better than easy ones.	0.76142	0.11412	0.32059
3. I prefer solving difficult problems to easy ones even if I make a few mistakes.	0.73634	0.09765	0.24212
4. I prefer problems I can easily solve to those I have to think hard in order to figure out.(R)	0.71786	0.06413	0.18255
5. Even if they take up more time, I enjoy subjects that make me think deeply.	0.74504	0.04593	0.29276
6. I have fun taking on complex and difficult problems.	0.74818	0.15565	0.39879
7. If possible, I would like to avoid difficult subjects.(R)	0.64070	0.21891	0.22765
8. When it comes to school subjects, the easier the better.(R)	0.51144	0.13919	0.24801
* Self-confidence items			
1. When I am speaking in class I get nervous that I will mess up (make a mistake).(R)	0.08268	0.85829	0.23375
2. In a debate, I can't really present my opinions for fear that I may embarrass myself.(R)	0.12118	0.84181	0.21443
3. It really stresses me to speak in front of my teacher and my classmates.(R)	0.03413	0.66070	0.20940
4. In class, I get nervous that the teacher may call on me to answer a question.(R)	0.25584	0.60770	0.21041
5. When the teacher asks the class a question, I can't say the answer even when I know it.(R)	0.04344	0.55972	0.15102
6. I get depressed whenever it's exam time.(R)	0.17730	0.51170	0.10312
7. Before taking an exam, I feel that I am going to bomb it (fail it).(R)	0.20523	0.47961	0.22798
8. When exams grow closer, I get so nervous that I can't sleep at night.(R)	0.07212	0.40666	0.02762
* Self-regulatory efficacy items			
1. I can assess the key points of what we learn in class.	0.29034	0.22586	0.79944
2. I can take good lecture notes on important material.	0.16171	0.10843	0.67025
3. I know the best study methods.	0.26311	0.24578	0.65146
4. I can discriminate what I know from what I don't know regarding the material we cover in class.	0.23435	0.21238	0.57857
5. I can retain what I learn in class.	0.39373	0.26618	0.61389
6. In class, I can easily make connections between what I am learning for the first time and what I already know.	0.32364	0.30711	0.56848
7. I can transform complicated and difficult information into something I can easily remember.	0.37945	0.19604	0.56458
8. I am able to complete tasks within the amount of time I am given.	0.25763	0.17440	0.50833
9. I can concentrate even in a subject I dislike.	0.30970	0.03497	0.48811

Note. Factor structure coefficient matrix is presented. (R) represents reverse coding item.

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APPENDIX C. Subject-Specific Self-Efficacy Scale

1. I am able to do good in language arts. (Korean)
2. I think I have a good understanding of the language arts curriculum. (Korean)
3. I am able to do good at social studies. (Social Studies)
4. I can easily grasp what we are taught in social studies. (Social Studies)
5. I am able to do good in English. (English)
6. I am able to do good at English reading comprehension. (English)
7. I am able to do good at mathematics. (Math)
8. I can use the appropriate equations effectively to solve math problems. (Math)
9. I am able to do good in the sciences. (Science)
10. I can understand the laws of science and the experimental process. (Science)